

The Mining Journal

London, January 11, 1957

In this issue . . .

| | |
|---|----|
| Base Metals into Gold—or Dollars | 45 |
| The Insatiable Demand for Metals | 46 |
| Mining Developments in Brazil | 46 |
| Whatever We Do—Let's Do It For The Right Reasons! | 47 |
| N.C.B. Ten Years Old | 47 |
| Raising Australia's Steel Output | 47 |
| By-Product Minerals | 48 |
| The Rehabilitation of Greek Mining | 50 |
| Scheelite Mining at King Island, Tasmania | 52 |
| Machinery and Equipment | 53 |
| Mining Miscellany | 54 |
| Metals and Minerals | 56 |
| London Metal and Ore Prices | 58 |
| Mining Finance | 59 |
| Company Announcements | 60 |

Vol. 248 No. 6334

Established 1835

Joint Editors

U. Baliol Scott

R. Bruce Dunfield

News Editor

A. G. Thomson

Financial Editor

I. M. Moseley

Assistant Editor

R. Bowran

Display Advertisement Manager

E. S. Hooper

Circulation

Robert Budd

Published each Friday by

THE MINING JOURNAL LTD.

Directors

E. Baliol Scott
(Chairman)

U. Baliol Scott
(Managing)

G. A. Baliol Scott

R. A. Ellefsen

**15, WILSON STREET,
LONDON, E.C.2.**

Telegraphic

Tutwork London

Telephone

MONarch 2567 (3 lines)

Annual Subscription £2 10s. Single copy ninepence

Base Metals Into Gold—or Dollars

IN the Middle Ages alchemists sought, with a faith undaunted by disappointment and disaster, for the Philosopher's Stone which was reputed to have the magic property of transmuting base metals into gold.

Recent experience in Eire suggests that a simple method has at last been discovered for realizing the equivalent of the alchemist's dream. Admittedly, the Irish are not converting base metals chemically or physically into gold, but they have succeeded in using base metals as a magnet to draw Canadian dollars into Eire, which from an economic standpoint is in accordance with the highest aspirations of alchemy.

As with all great scientific and economic discoveries, the basic principle is a very simple one. It consists, briefly, in creating conditions conducive to the adventuring of capital in the search for minerals and the exploitation of deposits. This has been achieved without any complications or difficulties by offering suitable tax concessions.

Eire's example has been followed by Mexico with results that promise to be no less rewarding. Mexico's mining potential is being vigorously investigated by a number of Canadian mining groups, with an enthusiasm which may eventually find expression in an investment estimated to aggregate \$70,000,000. A Canadian Embassy official was recently reported as stating that a new group of Canadian mining interests was passing through Mexico City every fortnight.

This surge of Canadian interest in Mexican minerals is the more remarkable when it is recalled, that until very recently, mine production was drifting downwards year by year and that the mining industry was experiencing so much adversity and discouragement that in some instances even silver mines were being slowly abandoned. This steady decline was due partly to transportation difficulties, but the root cause was the heavy burden of taxation imposed on the industry in return for its immunity from nationalization.

Mexico's tax laws were revised at the end of 1955, when concessions to assist both large and small mines were introduced. New companies are now lightly taxed. The effect of this change of fiscal policy has been to revitalize Mexico's long-ailing mining industry by drawing off investment money from the pockets of prosperous Canadian companies in a kind of monetary blood transfusion.

In Canada itself—where the expansion of the mining industry is among the economic wonders of the modern world—initial production from any mine is granted a tax-free period of three years and, in addition, the writing off of plant and pre-production development expenditure is allowed.

Australia, too, is now realizing that failure to discover large gold or base metal deposits (other than bauxite) in the Commonwealth during recent years has been due very largely to the deterrent effect of high taxation. The need for stimulants to boost mining and prospecting is likely to be met by the establishment of a tax-free mining zone, which is reported to be under consideration by the Commonwealth government.

It would appear that Britain is now among the very few countries in the world with a government which still fails to realize that the benefits to be gained from a more liberal approach to mining taxation far outweigh the comparatively small losses in revenue which might be experienced initially as a result of tax concessions.

Under present conditions metalliferous mining in the U.K. is doubly penalized by fiscal policy. Not only are exploration and development being throttled almost out of existence by high taxation, but mining companies are being forced to pay more for steel, because the discriminatory tax on distributed profits, together with inadequate depreciation allowances, make it difficult for the steel companies to raise fresh capital in the market for expansion projects, particularly in view of the constant threat of nationalization which hangs over this key industry.

In this era of atomic fission and hydrogen bombs we pride ourselves in being considerably more advanced scientifically than the mediaeval alchemist with his simple faith in the existence of the Philosopher's Stone. Yet the alchemist, muttering incantations over his crucibles, however unscientific his methods by modern standards, was at least prepared to try anything which held out the slightest promise of success.

This can scarcely be said of any British government since the war, so far as the transmutation of the country's own resources of base metals into gold, dollars, or even sterling is concerned!

THE INSATIABLE DEMAND FOR METALS

The history of non-ferrous metals is briefly surveyed by Metallgesellschaft Aktiengesellschaft in an introduction to the latest issue of its annual compilation of statistical tables (*Metal Statistics 1946-1955*), and some encouraging conclusions are drawn regarding future trends.

Continuous records of figures relating to the non-ferrous metals are only available from the beginning of the nineteenth century. From the year 1800 up to the present the production and consumption of metals has increased 230-fold, as compared with a three-fold increase in the population of the world. In the year 1800 the consumption of non-ferrous metals per head of the population was 0.06 kg.; by 1955 it had risen to over 4 kg.

This increase was due, on the one hand, to continued improvement in, and rationalization of, both mining and processing methods, and, on the other, to the development of conditions enabling ore deposits outside Europe to be opened up and exploited on a large scale. These factors were associated with a shift in the location of the smelting and refining plants and the manufacturing industries.

When the working of ore deposits in countries outside Europe was first undertaken it was not, in many cases, practicable at the outset (for both technical and financial reasons) to erect smelting furnaces in the vicinity of the mines. The ores, when extracted, were sent to the European "mine smelters"—i.e., self-supporting smelters with their own mines—and later on also to the U.S. In due course, as the output from the new mining countries increased, smelting works were also set up in Europe and the U.S. having no connection with any particular mine. These were the so-called custom-smelters, which took over the processing of foreign ores on a very large scale. The industrial countries thus maintained their leading position as metal smelters. As economic conditions in the mining countries overseas improved, more and more smelting works were set up locally in the vicinity of the mines.

There was thus a tendency to return to the former local association of smelting plant and mine, and this trend was accelerated by the two world wars, which severed normal communications between the overseas mines and the European smelters.

In the next few decades, rapid progress is to be expected in the industrialization of the under-developed countries; with it will come a corresponding increase in the demand for metals. It is not anticipated, however, that a geographical reorientation of the metal-manufacturing industry—comparable with that which occurred in the mining and smelting industries—will take place, because the highly industrialized countries will certainly retain their lead in the production of consumer goods in the foreseeable future.

Since 1954, political tension, government control of market conditions, strikes and so forth, have led—as with other raw materials—to violently fluctuating prices in the metal industry. Investigations have been undertaken and suggestions made with the object of achieving stabilized prices and means of inter-governmental agreements. However, various international commissions have reached the conclusion that the most practical way of keeping the rate of development of raw material prices steady is to obviate governmental encroachment on world markets, to eliminate restrictions on imports and exports, and to re-establish currency convertibility.

It is noteworthy that the increase in metal production and consumption since the beginning of the Industrial Revolution took place despite the fact that many other raw materials were available for the manufacturing industries and that, in the last thirty years or so, new raw materials—plastics—have been developed. Yet no raw material has been squeezed off the market; on the contrary, all available raw materials are in demand. Competition between individual metals, and between metals and other raw materials, has existed and still exists only in a few fields. The fact that there is an overlap in the fields of application for certain raw materials is healthy, since it means that the raw material with the best properties for a given purpose will win, unless the difference in price is prohibitive.

It is to be expected that the industrialization of under-developed lands will bring about a further considerable rise in the overall demand for metals. Assuming an increase in the metal consumption of these countries, per head of the population, equal to only half of the average of that in the industrial countries, the resultant additional demand would amount to 10,000,000 tons a year. Over and above this, it is highly probable that, for a considerable time to come, there will be a relatively rapid rise in world population and an overall improvement in standards of living. Thus, all the prerequisites exist for an increased demand for metals. Even if metals should, in the future, be replaced by other materials in some fields of application, a continuing increase (apart from fluctuations occasioned by varying economic trends) in the demand for all metals is confidently anticipated for a long time to come.

MINING DEVELOPMENTS IN BRAZIL

An area of 30,900 square miles in North-East Brazil, embracing parts of Pernambuco, Ceara, Paraiba and Rio Grande do Norte, has been mapped out from the air and is now being exhaustively prospected by the Department of Mineral Production (DNPM). Investigations to date have revealed occurrences of lepidolite, amblygonite, beryl, tantalite, columbite, magnesium, rutile, ilmenite and scheelite.

Rutile and ilmenite of good quality have been found in commercial quantities in Pernambuco and Ceara and deposits of high-grade scheelite have been discovered in Rio Grande do Norte and Paraiba. Ten scheelite mines are being worked at present; eight are in Rio Grande do Norte, the most important being at Currais Novas and in the Serido region. Mining processes are still primitive, however, and the Brejui mine, in Currais Novas, is the only one in which work is mechanized. The Wah Chang Trading Co., of U.S.A., which mines wolframite in Sao Paulo, is investing U.S.\$5,000,000 in plant to extract tungsten from scheelite in Rio Grande do Norte.

Five wolframite mines are now being worked in South Brazil, three at Jundiá, Sao Paulo, and two at Encruzilhada, Rio Grande do Sul, and a concession has been granted to prospect a promising deposit in Sta. Catarina.

WHATEVER WE DO—LET'S DO IT FOR THE RIGHT REASONS!

In their latest Review, A. Strauss and Co., comment on the proposal made by Bolivia that the price ranges under the International Tin Agreement should be revised upward. The Review foresees little difficulty in getting a simple majority of producers to agree. It thinks it also possible that the consumers would accept, since the United Kingdom has 40 per cent of the consumer votes and would be well disposed to an increase which Malaya would regard as in her own interests. The Review then goes on to discuss possible American reaction and states that the goodwill of America is essential to prevent the possibility of releases from the American stockpile.

America has, however, promised her benevolent neutrality towards the scheme and we might add that when it did so, it realized that the Agreement provided for the possibility of price changes. It is by no means certain that the Americans would object to a modest upward revision of the tranches and, provided it were modest, they would surely not threaten to use the stockpile. The future course of prices on the open market is clearly of the greatest importance, but if events were to show that, with the Texas smelter closed, the price of the metal managed to stay above the price at which the buffer stock manager is empowered to buy, then commonsense would insist that the price ranges should be revised upward. There would be no point in an agreement with price ranges so much out of line with market reality that the agreement could not operate.

If, however, by next March, when the Tin Council meets again, tin falls below £720 (and it never did in 1956) then the Agreement might be said to be operative and the demand for revision might (wisely perhaps) be postponed.

Although A. Strauss and Co. states that it would be wise to secure American goodwill before revising prices, it is interesting to note that M. Peter said at the time of the last Council meeting that there was no intention of informing the Study Group of this matter. Yet the Study Group was kept in being solely for the purpose of keeping some official contact with the U.S. government on tin.

If producers feel that they should have an upward revision of prices they ought to find a different sponsor for their claim than Bolivia. Since no conceivable revision could match the selling tranches to Bolivian production costs, it would seem that the new figures (whatever they may be) are being claimed not to equate demand and supply, nor to match higher production costs, but to bolster Bolivia's foreign exchange earnings. Now whatever function a commodity agreement is expected to perform the bolstering of exchange earnings of a member country is not one.

N.C.B. TEN YEARS OLD

The British National Coal Board celebrated its tenth birthday this month and to mark the occasion issued a lavish brochure presenting its life story. This publication, "British Coal—the Rebirth of an Industry", whilst not unnaturally glossing over certain unsatisfactory details, nevertheless presents a reasonably impressive account of achievements. 30,000,000 more tons are now being supplied to industry than in 1946 and with much the same manpower output has increased by approximately one-seventh. Productivity per man-year has gone up from the 1946 figure of 260 tons to 300 tons. Pay increases in this period have now placed the mineworker at the top of the country's wage earners.

The brochure confirms that the N.C.B. made a substantial profit in 1956—believed to be in the region of £10,000,000. It defends the industry's record over the past ten years and points out that British coal is still the cheapest in Western Europe. However, it does not draw attention to the fact that the pithead price has doubled since nationalization or that more money has been spent on modernization than in other West European coal industries.

However, it must be conceded that the Coal Board took on a formidable task on January 1, 1947, and if it is indeed true that "the first ten years are the worst," one can almost believe in the translation into reality of the Board's declared intention to make of the 800 odd British collieries the most progressive coal mining industry in the world.

RAISING AUSTRALIA'S STEEL OUTPUT

Completion of the new open hearth steel plant by Australian Iron and Steel Ltd. at its works at Port Kembla, New South Wales, will increase the combined steel making capacity of the plants at Port Kembla and Newcastle to 2,600,000 tons per year.

In its initial run, 200 tons were tapped in 5 hours 44 minutes, after charging. The completed cost of the plant is £A5,500,000 and the resulting increase in steel production is 350,000 tons, or 15.6 per cent., the increase at the Port Kembla works itself, being 28 per cent. The plant contains two furnaces, each with a capacity of 275 tons, previously existing furnaces having a capacity of 240 tons. The ladle crane has a lift capacity of 410 tons. The new plant will ultimately be served by No. 4 blast furnace, now under construction, which will be one of the world's largest.

Agitation still continues for the establishment of a steel industry in South Australia, a section contending that the iron ore resources of the State should be used in that State, and for its benefit. At present the ore is mined by the Broken Hill Proprietary Co. and smelted in New South Wales. Supplies of iron ore for a State, or a second privately owned, industry could be obtained only by repudiation of agreements with the Broken Hill Proprietary Co. and the acquisition of the iron ore deposits now operated by that company, which has built the modern town of Whyalla, where an iron blast furnace is in operation, and an important ship building industry has been established.

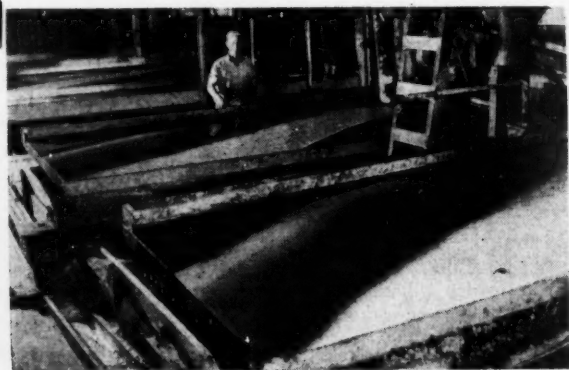
In the course of debate it was pointed out that under present conditions it would cost the Broken Hill Proprietary Co., which will review its Whyalla operation in 1959-1960, £A10 per ton more to produce steel at Whyalla than at Newcastle or Port Kembla, should it establish a steel works at Whyalla.

WHILST nearly all common metals are on occasions the by-product or co-product of a mining operation, this article is essentially concerned with those which are economically recovered solely as a by-product. Minerals containing these rarer metals are commonly recovered in the mining of base metal ores and are present in the concentrates sent to the smelter. During the evaluation of deposits and the working of smaller mines, however, their presence may be overlooked and the importance of possible by-products has often not been realized in estimating the value of an orebody or prospect.

In recent years there has been a rapid development of commercial uses for elements which hitherto had been neglected, and which were of doubtful market value. However, it remains difficult to assess the value of the by-product contents of an ore in any particular instance because their price and level of production often bears little relation to normal supply and demand factors. Geared to the production of another mineral by-products have, as it were, no economic life of their own and although many of the rarer metals occurring in this fashion are of strategic importance, their production is inflexibly linked with the demand for the primary product, and they may for this reason be neglected by industry.

An increased industrial demand for a by-product metal is more readily reflected in the price at which existing production is marketed rather than in production levels. Most by-products are recovered in costly refinery installations, and a guaranteed demand is required before erection of a by-production plant is justifiable. The high basic operating costs of these plants offers industry little hope of reduced prices for by-product materials as a result of increased and regular usage, and a slackening of demand to below production capacity is more likely to result in the suspension of operation of by-product recovery plants than in reduced market prices of the metal produced. There is a great need for the development of low-cost recovery techniques before the majority of by-product metals can play their full part as industrial raw materials. Recent advances in ion-exchange processes, in solvent extraction and in chromatographic techniques are all likely to assist in the solution of this problem and to help in achieving the relatively high state of purity required for the industrial usage of many of the hitherto rare metals.

Many of these metals have long ceased to be "rare". For example practically all the world's cobalt is recovered as a by-product from complex ores mined mainly for their copper and other base-metal content, and it has been estimated that about 2,000 tons of germanium and nearly as much gallium could be recovered annually from British coals. Germanium is an example of the rapid development taking place in the use of by-product metals having grown from being a metallurgical curiosity before the war into a widely-known industrial material now being produced at a rate of 10 tons per annum.



The rapid growth in the use of titanium and the exploitation of beach sands for their rutile content has given rise to important production of the minerals zircon and monazite with which rutile is commonly associated. However, these minerals are co-products rather than by-products of the rutile industry and their inclusion in this article could be disputed. Zircon is used in the manufacture of metallic zirconium for atomic reactor and jet-engine construction and has an important by-product, hafnium. Monazite has leapt to importance as a source of thorium which also has interesting applications in the nuclear engineering field, and there has been a consequent increase in the production of the rare earth elements, present in monazite.

By-Product Minerals

The rapid increase in production of niobium and tantalum, two metals which grew to be of vital strategic importance during the war, has led to the growth of an industry in Nigeria where the source-minerals of these metals are recovered as a by-product of the tinfields where they were formerly discarded as waste.

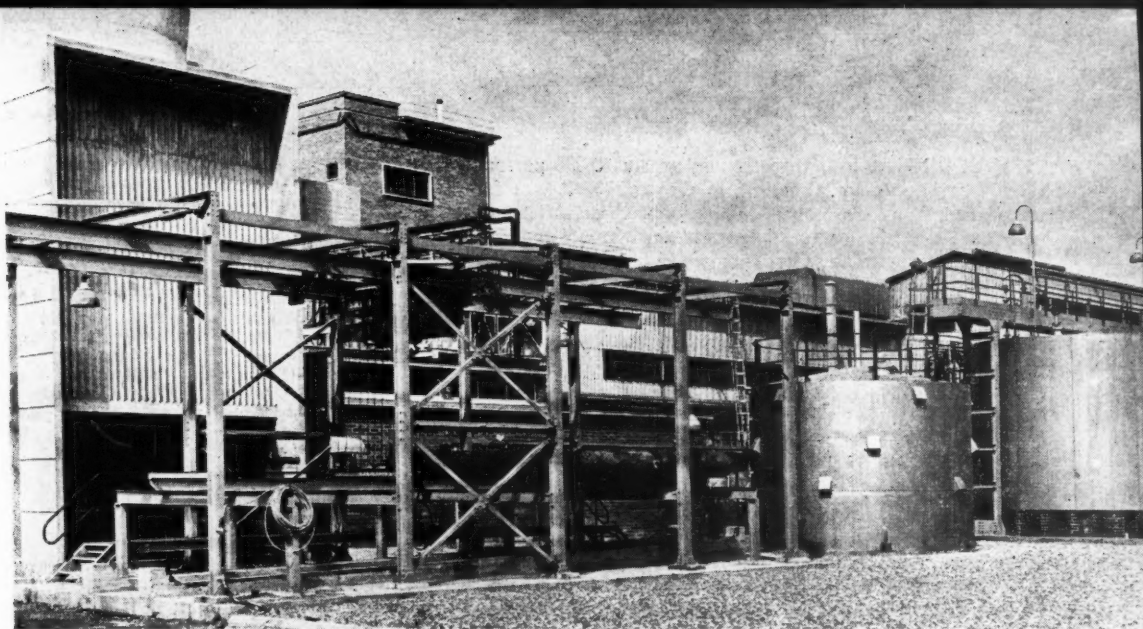
Cadmium

World production of cadmium has risen steadily from about 4,000 tons in 1946 to nearly double this amount in 1955. All the cadmium of commerce is recovered as a by-product in the treatment of zinc ores, the only cadmium mineral of importance, greenockite, never occurring separately in quantities sufficient for economic working. Zinc ores normally carry less than one per cent cadmium, and it is not generally paid for by the smelter. Some zinc ores, notably those of South West Africa, carry higher than usual cadmium values.

The main use of cadmium is in electro-plating such items as automobile carburettor and magneto parts, car fittings, aircraft, radio and television parts and nails, nuts and bolts. It is also used in bearing alloys, fusible alloys and as a pigment. There are also minor uses in dentistry, photography and in dyeing.

The demand for cadmium is variable and, as is typical of by-products, the output is unresponsive to this demand. Cadmium is a competitor of its "parent" metal zinc, but due to its high cost in comparison with zinc this filial ingratitude is unlikely to prosper and zinc is increasingly used as a substitute for cadmium in plating and alloys. Cadmium has, however, some uses which make it of strategic importance and which may ease the present state of over-supply and act as an incentive to increased production.

Wilfley tables being used in Australia to separate silica from the rutile-zircon-ilmenite concentrate won in beach sand mining



General view of the I.C.I. General Chemicals Division titanium plant at Wilton, Yorkshire. The picture shows storage facilities for argon and titanium tetrachloride

One important use is in nickel-cadmium batteries which can contain up to 7 lb. of cadmium. Storage batteries of this type containing 2 to 3 lb. of cadmium have long been used in omnibuses and in certain luxury class cars. Their initial cost is several times that of a lead/acid battery, but long-term economies may be effected, as is evidenced by the fact that such batteries are often salvaged from old omnibuses for use with their replacements ordered minus batteries for this reason. Whilst a lead/acid accumulator has long dominated this field the increasing demand for efficient electrical storage cells of large size augurs well for the future use of cadmium.

Cadmium has found great favour on account of its high neutron absorption cross-section for the manufacture of control rods in nuclear reactors. With the growth of nuclear energy projects increasing amounts of cadmium will be required for this purpose, and the importance of cadmium in the atomic age can be predicted with greater confidence than with many of the metals so far used in experimental reactors.

Cadmium is also used as the sulphide in solar generators but in this strictly limited field of power generation consumption is insignificant. One further use of cadmium in the electrical field does deserve mention, however, namely its inclusion in alloys, notably with copper and zirconium, for electrical transmission lines.

Caesium

Caesium is not a by-product in strictly the same sense as cadmium in that an economic source exists in the mineral pollucite which has been mined at one or two localities. The main source, however, is the caesium content of beryl, lepidolite and other minerals mined for their beryllium or lithium content. All these source minerals occur in pegmatites and more often than not are co-products of the same mining operation. Caesium deserves mention here if only to stress its importance to the operators of small pegmatite mines where its presence may be unsuspected and unrecognized.

Caesium has become important because of its use in photo-electric cells and television tubes, and as the most alkaline of all elements it has considerable potentialities. Spectrographic instruments and scintillation counters also utilize caesium. There are undoubtedly many potential uses of caesium which remain undeveloped because of the

uncertainty of supplies of the raw material. Radioactive caesium isotopes are also a by-product of nuclear fission reactions and increasing mention of this element can be expected.

Indium

Zinc plant flue dusts are the source of indium which may be present up to one per cent in sphalerite. Indium also occurs with gallium in some tin and manganese ores. Industrial uses of the metal were not investigated until just before the second world war and the number of applications since developed promises well for the industrial future of the metal. Indium imparts hardness to many alloys and is used for bearings in aero engines. Aircraft propellers with a coating of zinc/indium alloy have desirable corrosion-resisting properties. Because of special surface properties indium is useful for lubrication treatment of gearwheels and special bearings. Similarly an indium-tin alloy is capable of making effective glass/metal seals. Indium can also be used in the manufacture of transistors and is used for cinema screens and in medicine.

Coincident with the rapid growth of industrial uses for indium the market price has sharply declined as the metal progressed from being a chemical curiosity to an accepted raw material.

Thallium

Thallium is a rather neglected by-product. Discovered nearly a century ago it still has very few industrial uses, and the supply exceeds demand. Thallium is a by-product of the lithopone industry, and can be recovered in the roasting of pyrite and smelting of lead/zinc ores. Small quantities are produced in the U.K. from cadmium residues. Its most important property commercially is that it is a strong poison and it is used as a fungicide and rat poison. Mercury/thallium alloys have a low melting point, and can be used where fusible alloys are required. Some special glasses contain thallium and it has potential uses in electronics for the detection of infra-red light and other radiations.

Notes on other by-product minerals will appear in a subsequent issue.

BEFORE the second world war nearly 10,000 persons were occupied in mining in Greece which was far from fully developed, but produced a variety of minerals. Chrome, nickel, magnesite and bauxite found a ready export market. Greek emery was considered the finest existing material of its kind and was used throughout the world.

The Greek mining industry was severely affected by the war and the subsequent civil wars, and extensive re-equipment and rehabilitation were necessary. In 1948 the average output from all the mines was about 10,000 tonnes a month, compared with a pre-war figure of 80,000 tonnes a month. Since 1948 American aid has played a large part in providing the financial means for rehabilitation and by the end of 1955 over \$35,000,000 had been provided for this purpose.

The Greek Ministry of Commerce was recently reported to have reached agreement with the Association of Greek Mineowners, under which the Greek authorities would grant more help for the development of the country's mines. Special attention would be paid to the setting up of new facilities and to plant for the further processing of mineral products.

The Mining Industry To-day

Some of the principal projects for the expansion of mine production in Greece were described in a recent issue of *The Mining Journal* (14/9/56, p. 307); notably the Ptolemais lignite project, a programme for the further development of the Larymna iron and nickel mines, and the expansion of lead and silver production at the Laurium mines. Apart from major schemes, a number of mineral deposits are being actively exploited, but in some sectors of the mining industry production, although increasing steadily, is still on a much smaller scale than before the war.

Deposits of iron ore are found over a great part of Greece and its islands. Before the war production was at the rate of over 300,000 tonnes a year, accounting for a



Greece has been a source of minerals for many centuries. Alexander the Great is said to have equipped his forces with gold from a Macedonian river. The still prosperous silver, lead and zinc mines at Lavrion (Laurium) are believed to have been started in the fifth century B.C. These gleanings from early mining history are extracted from a review of economic and commercial conditions in Greece by F. C. Mason, Counsellor (Commercial) at H.M. Embassy in Athens. One of the series of Overseas Economic Surveys, this publication has been issued by the Board of Trade, Commercial Relations and Exports Department. Copies are available from H.M. Stationery Office, Kingsway, London, W.C.2 and branches, price 4s. 6d. (by post 5s. 1d.).

third of the production of all minerals. There are extensive occurrences in Chalkidiki in Macedonia, where the largest mine, owned and worked by the Hellenic Chemicals and Fertilisers Co., is currently producing about 84,000 tonnes of ore a year. Iron ore is also being worked in the Cyclades Islands (the largest mine being on Serifos) and on Kithnos and Sifnos. Skyros, in the Sporades Group, is the site of smaller mines.

The Rehabilitation

As yet, iron ore mining has not reached its pre-war level of production, but in 1955 it rose to 192,000 tonnes from 77,000 tonnes the previous year. Last year an American company, known as the International Import-Export Corporation, bought out the Bank of Chios, thus acquiring control of the Atalanta Iron Mining Co. which owns the richest iron ore deposits in Greece conservatively estimated at 10,000,000 tonnes.

Extensive deposits of bauxite occur at Elefsis, near Athens (where the Elefsis Bauxite Mines Inc. now produce almost 300,000 tons a year), near Mount Parnassos, Distomon, Mandra and Lamia, in Chalkidiki, and on the islands of Euboea and Amorgos. Before the war the largest production came from the Mount Parnassos areas, but the mines in this area were taken over by the occupying Germans and were eventually sequestered by the Custodian of Alien Property. At the present time 12 mines in the Parnasse Mountains are being worked by the Bauxites Parnasse Mining Co., the annual output being in the region of 450,000 tonnes. Vast deposits have still to be developed. A third company, the Barlos Bauxites Hellas Mining Co. Ltd., with mines in the Distomon area, is producing about 30,000 tonnes yearly, most of its output being exported to the U.K. as refractory bauxite for cement manufacture.

Pyrites production is mainly concentrated at the Maden Lakkos mine in Chalkidiki, owned by the Hellenic Chemicals and Fertilisers Co. The same company also owns a pyrites mine at Hermioni in the Peloponnese. The combined production of these mines was about 200,000 tonnes

An American ore crusher for service in the Greek mining industry

CHIEF MINERAL PRODUCTS

(1,000 tonnes)

| | 1955 | 1954 | 1953 | 1952 | 1951 | 1950 |
|----------------|------|------|------|------|------|------|
| Antimony ... | — | — | 5 | 3 | 6 | 3 |
| Barytes ... | 19 | 22 | 27 | 22 | 29 | 21 |
| Bauxite ... | 500 | 354 | 328 | 285 | 164 | 77 |
| Chrome Ore ... | 9 | 8 | 10 | 6 | 7 | 5 |
| Iron Ore ... | 192 | 77 | 88 | 158 | 53 | 5 |
| Lead ... | — | — | 50 | 44 | 88 | 56 |
| Magnesite ... | 61 | 104 | 107 | 79 | 61 | 26 |
| Manganese Ore | 25 | 17 | 14 | 20 | 16 | — |

in 1952. With U.S. aid the company has recently established a plant producing pyrites concentrates, and is now producing over 30,000 tonnes a year. In view of the increasing shortage in Europe the market for Greek pyrites seems to be assured. Exports are being made to Germany, Belgium, Austria, the Netherlands, Switzerland, Italy and the U.K.

There are at present 12 producers of magnesite ore in Greece, among the most important being the Anglo-Greek

of Greek Mining

Magnesite Co. Ltd. in Macedonia and Euboea, the Financial Corporation of Greece at Scalistiri and the Vavados Mine at Vryonis. In 1954 the total production of ore amounted to 104,000 tonnes—approximately double the tonnage exported in 1939—but it fell in the following year to 61,000 tonnes. Most of the ore is used for the manufacture of calcined magnesite, which sells better than raw magnesite. The best market is for dead-burned magnesite refractory, but none of the mines, which were destroyed during the war, has yet been re-equipped for its production.

So far only two companies have recommenced the production of refractory chrome ore, but various pre-war mines, which were hard hit in the period of guerrilla warfare, are likely to resume operations. The largest mines are those of Alexander Apostolides, near Pharsala in Thessaly and near Kozani in Macedonia. The other company is the Union Minière, which works a large mine in Thessaly but is still producing only a small portion of its pre-war output. The less important mines are all in Thessaly and Macedonia.

The only barytes mine in Greece is on Milos Island and is owned by the Silver and Baryte Ore Mining Co. Its production, from an open pit mine, is about 23,000 tonnes a year. The silver content of this ore is low and its recovery has not proved successful. Prospecting for further deposits is at present being carried out by an American company on the island of Mykonos.

Antimony is found in Macedonia and on the island of Chios. The most important mine is on Chios. Owned by

the Hellenic Mining Co., it was being re-equipped with a furnace for the production of antimony metal, but work was suspended in 1955 because of low world prices. A mine at Lahana has a small output of ore, but other mines in Macedonia have not resumed production since the war.

Before the war some battery grade manganese ore was produced by small mines in Macedonia and Thrace, but ore that was recently produced had a high percentage of silica and was only of use to a limited market. Last year the Greek government approved the importation of \$108,000 worth of equipment by the Brussels Mining Enterprise Co. for the development of manganese mines in Styra-Euboea. Annual output is expected to reach 10,000-15,000 tonnes of ore. A Norwegian company, Veibyg A/L of Brumendal, has been granted a concession giving it the right to mine manganese ore in Larizza, Central Greece, where prospecting has been in progress for some time. Veibyg has formed a subsidiary company which will have its head office in Athens.

Other Mineral Deposits

Zinc carbonate ore was worked on the island of Thassos before the war, but the ore is of low grade and only small quantities can be sorted by hand. Production has not been resumed.

There are various places in Greece where chrysotile and tremolite asbestos occur. A contract has been negotiated between a U.S. company and the Greek government for the exploitation of asbestos deposits at Kozani.

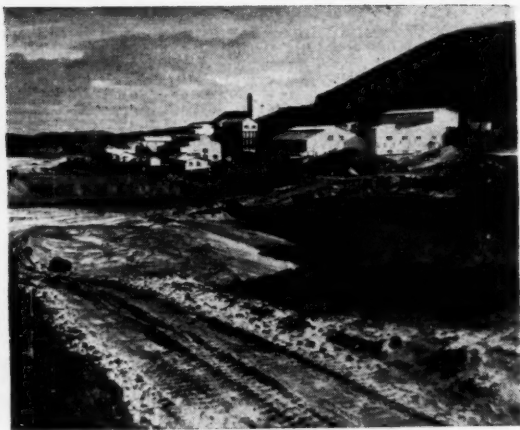
Sulphur is mined and refined in small amounts on the island of Milos. It occurs in volcanic ash deposits but is of low grade. The annual production is about 5,000 tonnes.

High-grade emery is mined from large deposits on Naxos Island. Production is controlled by the State and is about 5,000 tonnes a year. The export of this material has declined since the war due to the increased use of synthetic abrasives.

The Northern Greece Gold Mines Co. works a dredge on the Gallicos River in Macedonia, which was put into operation with a U.S. loan in 1950. Gold is recovered from the gravel at a plant at Kilis and small quantities are sold to the Bank of Greece.



Foundations for a new flotation mill on the site of the ancient Laurium silver mines



The works of King Island Scheelite Ltd.

THE large open cut scheelite mining undertaking of King Island Scheelite (1947) Ltd., situated on King Island, off the north coast of Tasmania, has worked successfully since the later years of the war. Satisfactory long-term contracts have allowed the company to expand its rate of production. Metallurgy has been improved and recovery of mineral increased.

Scheelite Mining at

In the last financial year, to October 31, overburden removed from the orebody ahead of the open cut amounted to 1,555,035 tons and ore milled totalled 265,919 dry tons. There was no interruption in operations and operating time of 360 days was recorded, in which time concentrate production was 1,521 tons, valued at £A2,486,845. In the previous year, figures for comparison were: overburden removed, 1,351,429 tons; ore milled, 262,405 tons; operating days, 360; concentrate produced, 1,394 tons, with a value of £A2,366,950. Development keeps pace with ore

Scheelite concentrate passing through the flotation plant



Terracing method of working the open cut

extraction and available information does not depreciate the life of the mine.

The open cut is worked by the terracing method. For each ton of ore won, approximately a ton of overburden has to be removed. Quarry plant includes two $2\frac{1}{2}$ cu. yd. diesel power shovels and two 2 cu. yd. similar units, twelve six-ton trucks and two bulldozers. The ore recovered averages 0.6 per cent tungsten oxide.

After milling, the scheelite ore is treated in the gravity section of the recovery plant, wherein 24 Wilfley tables are

King Island, Tasmania

operated. After passing through the gravity section, the proportion of scheelite concentrate not recovered by gravity passes through the flotation plant. Ore from the open cut is more highly oxidized than ore from underground workings and therefore presents a difficult flotation problem. In this section the recovery rate at present is about 85 p.c.

A $2\frac{1}{2}$ cu. yd. Ruston-Bucyrus shovel in the open cut



Machinery and Equipment

Experiments with a Face Airbreaker

The use of high-pressure compressed air for breaking down coal in this country was suggested by the British Coal Mining Productivity Team after its visit to America in 1951.

The system consists essentially of an electrically-driven compressor, operating at pressures up to 12,000 lb./sq. in., pipelines for conducting the high-pressure air to the face, and shells for discharging the air in shot holes in a manner similar to the use of Cardox. The principal difference between "air-shooting" and Cardox—and one of the advantages of the system—is that only one shell is in use in a working place at a time; this is inserted in one of the holes in the coal or stone to be broken down, charged with high-pressure air, discharged at the appropriate pressure by a shear-pin device, and is then transferred to the next hole for re-use.

The first installation of this type in Great Britain, using Armstrong air-breaker equipment, was put in at Bank Hall colliery (No. 4 Area, North-Western Division).

The compressor is a six-stage machine with horizontally opposed cylinders, the outlet air from each stage being taken to a multicoil intercooler where the ventilating current is blown over the coils by two 20-in. fans mounted in parallel.

The full-load current now being taken in normal operation is 84 amps. at 550 v., confirming that a motor of this rating is necessary.

The compressor control includes a Bourdon tube connected to the pipeline and coupled mechanically to a switch in the pilot circuit of the motor. The device can be adjusted to stop the motor at any desired pressure and to re-start it after a drop of about 2,000 lb./sq. in. When checked recently it was functioning regularly at about 11,650 and 9,500 lb./sq. in.

In the motor circuit there is also a three-way electro-pneumatic valve which, when the motor stops, causes lines from all cylinders except the first stage to be vented to atmosphere, thus allowing the compressor to re-start under no-load conditions.

The compressor house is approximately 23 ft. x 10½ ft. and 12 ft. high, with brick side-walls and girder roof, the compressor itself being built on a concrete raft 18 in. above floor-level for convenience.

At a convenient distance from the discharge end of the rubber hose, connected directly to the inbye end of the steel mains, a firing valve is inserted; this is of robust construction and is furnished with an operating key. In its original form the key was an intrinsic part of the valve, but has been made removable at Bank Hall so that the "shooter" may keep it in his possession as in the case of an exploder key for shotfiring. In addition to a closed position (when the shell is open to atmosphere) and one at 180 deg. when the shell is charged with air from the pipe-range, a further movement of the key exhausts air from the shell and the line back to the copper air valve which allows air to be exhausted before moving the lines.

The shells used are of the shear-pin type, the actual pins being wire nails whose size can be changed to give the desired discharge pressure. After a number of experiments the most successful shell for normal usage was found to be 54 in. body (71 in. overall), 198 cu. in. capacity, using a number 9 nail (0.144 in. in dia.) with a discharge pressure of about 7,100 lb./sq. in. If for any reason a lighter discharge is needed a number 10 nail is used.

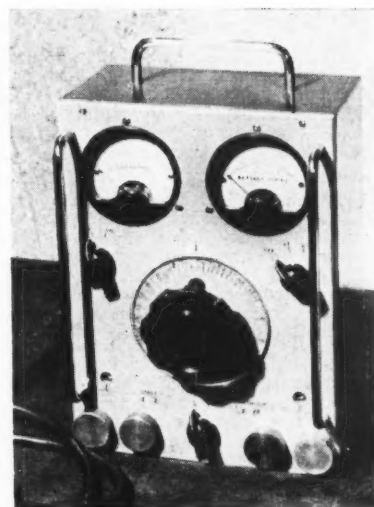
SORTING NON-FERROUS METALS

The sorting and identification of non-ferrous metals and alloys by means of a portable, lightweight, battery-operated instrument, easy to read and operate, is a need in the metallurgical industry.

The basic design of the Solartron Metal Sorter and Resistivity Test Set, Type MM 611, originated from The British Aluminium Co. Ltd. The instrument is operated by dry batteries and may be used anywhere where there is no electricity supply.

The Portable Metal Sorter and Resistivity Meter, or Test Set, consists of an investigating head on a lead, which is plugged into a small instrument case. The test heads are interchangeable and designed to ensure that changes of ambient temperature do not cause drift. The head is placed on the metal surface, which need not, necessarily, be flat.

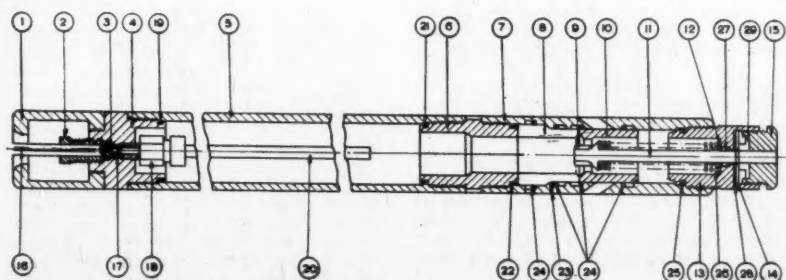
Identification is based upon the specific resistivity of the particular metal. Because this is a physical constant of which every metal and alloy has its own specific



The sorting and identification of non-ferrous metals and alloys is possible by use of the Solartron Metal Sorter and Resistivity Test Set, Type M.M. 611

value, its measurement gives a figure which identifies the metal being tested. Provided the metal or alloy has a specific resistivity between 1.0 to 28.0 micro-ohms per centimetre cube, it may be measured, or, inversely, the metal or metals distinguished or sorted.

The wide scope for this instrument is indicated by the following examples of materials that can be tested by its use: Pure copper, gold, pure aluminium, molybdenum, aluminium alloys, radium, tungsten, cadmium, rhodium, zinc, brass, osmium, palladium, platinum, tin, tantalum, magnesium bronze, lead and tellurium, and, of course, many of their various alloys. The minimum requirements of the equipment are that the surface of the metals tested must be sensibly smooth, but need not be flat, and the test portion should have a minimum diameter of 0.75 in. (2 cm.) and have a minimum thickness of approximately 0.02 in. (0.5 mm.). The Portable Metal Sorter and Resistivity Meter enables surveys, or examinations, to be carried out in either confined spaces inaccessible to normal size equipment, or on large structures, which are too big for the test house.



Section through the Armstrong airbreak shell tested at Bank Hall Colliery, showing 1, Nose; 2, Nut; 3, Plug; 4, End Cap; 5, Shell (2½ in. o.d. - 2½ in. i.d.); 6, Adaptor; 7, Head; 8, Keeper; 9, Stem Nut; 10, Valve; 11, Stem; 12, Washer; 13, Cap; 14, Shear Pin; 15, Shear Nut; 16, Copper Tube; 17, "O" Ring; 18, Erme to Sleeve, Sq. Male Nut, Inlet Fitting; 19, "O" Ring; 20, Cooling Tube; 21, "O" Ring; 22, "O" Ring; 23, Vent; 24, "O" Rings; 25, "O" Ring; 26, Springs; 27, "O" Ring, Backup Leather; 28, Guard; 29, Shear Washer

MINING MISCELLANY

Deposits of iron ore estimated at about 2,000,000 tons have been found in the Vasterbotten and Jamtland Hill areas of Sweden.

Chile's new mine, El Salvador, owned by the Andes Copper Mining Co., is expected to begin extraction operations in 1959. The deposits are estimated at 130,000,000 tons of grade 1.6 per cent ore.

The Compagnie Minière du Congo Français is to exploit lead deposits at Hapilo in French Equatorial Africa. The ores will be transported by cable railway to M'Fouati, five kilometres away where there is a concentrator already serving a mine in the area. Production was due to begin at the beginning of this year.

The Braden Copper Co. has requested authority from the Chile Government to build a new sulphuric acid plant at El Teniente mine at a cost of U.S. \$3,000,000. The daily output of acid will be increased from 50 to 70 tonnes when the new plant comes into operation.

Nipissing Mines Co., a Canadian undertaking with a long history of activities in the U.S., expects to start production in the first half of 1957 at the Ore Knob copper property in North Carolina. A production rate of 750 tons a day is planned for the mine, which has been under development for several months.

An article on openings for U.K. industry in Peru (*Board of Trade Journal*, 29/12/56, pp. 1358-1360), states that considerable development of mineral resources is being carried out, almost entirely by U.S. concerns, the most important being the opening up of the copper deposits at Toquepala in Southern Peru, and of iron ore in the south. There is an extensive demand for mining machinery, but the most important mining companies are subsidiaries of U.S. firms and tend to order their requirements in the U.S.

Explorers Alliance Ltd. has assigned its right to undertake development of a copper concession in the Roaring Water Bay region of south-west Ireland to Nor-Acme Gold Mines Ltd. In return, Explorers retains an interest in the concession to participate in its future financing. This is the third Irish property to be placed under active development by Explorers finance since September. The others are a lead-zinc prospect at Wicklow and a copper concession at Waterford.

The discovery of a deposit claimed as the largest and richest beryl mine in the U.S. was recently reported in the *Denver Record*. The find was made in the Old Boomer Mine situated about 11 miles north-west of Lake George, near Colorado Springs, Colorado. Some of the ore has fetched as much as \$500 a ton, it has been stated. Two truckloads recently brought a return of \$13,000.

In addition to beryl, there are believed to be extensive bodies of copper, tungsten, silver and uranium ores in the Swandyke formation, which is one of the oldest formations in Colorado.

The U.S. government has appealed to the Supreme Court from the decision of the Court of Claims that gold mine operators are entitled to compensation for damages sustained under order L-208, thus prolonging the controversy for several more months. This is the last move the government can make in attempting to keep these cases from coming to a hearing.

India's second five-year plan (1955-61) provides for the expenditure of 520,000,000 rupees on the Neyveli open cast lignite mining project in Madras State, which envisages the mining of 3,500,000 tons of lignite a year. The value of the machinery and equipment so far ordered for this project is in the region of 55,000,000 rupees, according to the Indian Deputy Minister for Production, Latish Chandra.

Six West German geologists employed by the consulting firm of Wedexro, who had been surveying South Sumatra and South Borneo for iron ore, bauxite and coal, returned home to prepare a report for submission to the Government of Indonesia in April, 1957. The government's policy towards the establishment of an iron and steel industry will be based on its recommendations.

The Marinduque Iron Mines Agents, Inc., is scheduled to start copper production by February, 1957, at its \$5,000,000 project in Sipalay, Occidental Negros. Mine officials expect a net production of 835 stons of copper per month from this new Philippine producer. They state that the Sipalay area has very large potential reserves. In one section a deposit has been exposed which contains several different grades of sulphides and will take at least 10 years to mine. It is estimated that this particular area will yield at least 9,100,000 tons of ore assaying about 1 per cent copper. Another deposit said to contain twice as much ore as the first area has not yet been exposed.

The great extent of New Zealand iron sand deposits, the development of electric smelting and the large increase in demand for steel have greatly improved prospects for a steel industry in the Dominion, states the latest Reserve Bank bulletin. These circumstances warrant a thorough investigation of the proposals of Mr. W. R. B. Martin, who is conducting research on iron sand at Victoria University College. Mr. Martin envisages a steel plant of 250,000 tons initial capacity on re-claimed land at Bluff, where ample supplies of coal and lignite are available close at hand, as well as untapped resources of water power. He is at present endeavouring to find a satisfactory method of extracting titanium from iron sand.

Inspiration (Anaconda) is meeting with success in its venture of rehabilitating the old Christmas mine in Arizona, reports our correspondent. Developments to date indicate an ore reserve of 10,000,000 tons averaging two per cent copper in the so-called O'Carroll Bed with an indefinite amount of lower grade encountered in the course of development. At the company's main operation at Inspiration, Arizona, construction of the new mill is almost finished. The new plant will supplant the old ferric sulphate leaching process and employ acid leaching, followed by concentration. This is expected to increase production to 42,500 tons of copper per year.

Refuse from mineral treating plants in north-eastern Florida may become a source of raw materials for making high-temperature industrial refractories, according to a Bureau of Mines Report released by the U.S. Department of the Interior (Report of Investigations 5274). The report gives details of laboratory tests at the Bureau's Southern Experiment Station, Tuscaloosa, Alabama, where high-grade kyanite-sillimanite products were recovered from tailings obtained at plants producing titanium and zirconium minerals. According to the report, successful application of a combined magnetic separation and flotation process would yield several thousand tons of mixed kyanite and sillimanite a year. Recognising the potential value of the tailings, operators of Florida mineral plants are stock-piling them.

The potential wealth of Southern Africa's great mineralized zone, stretching north from the Free State and Northern Cape through Rhodesia to Katanga, may prove not far inferior to the mineral wealth of the U.S. or Russia, according to a recent statement by Mr. C. J. Hatty, Minister of Mines for Southern Rhodesia. Mr. Hatty said there were samples of nearly every important metal and mineral in the Colony's mineral deposits. This year's output of minerals was likely to be about 8 per cent higher than last year and there would probably be a further 8 per cent increase in 1958—provided the railways could keep pace. Pointing out that practically every major South African mining group was now active in Southern Rhodesia, the Minister said that a new era of mining seemed to be starting in the Colony, on lines along which mining had latterly evolved in Canada.

Cartier Mining Co. Ltd., a subsidiary of the U.S. Steel Corporation, is planning to form a new company to investigate and develop a large iron ore mining site north of Shelter Bay, Quebec. If the project is proved to be a worthwhile endeavour after all investigations have been completed, a large expenditure will be involved. Iron ore concentrating plants would be built to produce high-grade concentrate, suitable for blast furnace use, from low-grade deposits with an iron content of about 30 per cent. A ship-loading centre would be estab-

lished at Shelter Bay on the St. Lawrence River. The prospect would also call for a 150-mile railway to the first mining site, 70 miles south of Mount Wright, a mining town, and a hydro-electric power plant on the Hart Jaune River.

The Consolidated Pneumatic Tool Co. Ltd. have announced new plans for the development of their business in the Federation of Rhodesia and Nyasaland. The company has operated in these areas for many years through the agency of J. Clack and Co. (Pvt.) Ltd., but the large industrial development has brought a need for similar expansion in the sales and service facilities offered by the company. A new company, to be known as the Consolidated Pneumatic Tool Co. of Central Africa (Pty.) has therefore been formed. Its head offices are at 142c Abercorn Street, P.O. Box 278, Bulawayo, S. Rhodesia. The new organization starts operations on February 1, 1957, on which date J. Clack and Co. cease to handle C.P. business in the Bulawayo territory. The latter company will continue representation in the Salisbury and Ndola territories for the time being, with the assistance of C.P. technical staff. The managing director of the new company is Mr. R. G. Wells, who has been associated with Consolidated Pneumatic in Central Africa for over 20 years.

PERSONAL

Three leaders of the Rhodesian mining industry were honoured in Salisbury on December 17 when they were presented with honorary life membership of the Rhodesian Chamber of Mines. They were Mr. E. G. Harding, Sir Ellis Robins and Sir Digby Burnett. Sir Digby was unable to attend because of illness.

Mr. R. H. C. Boys has been appointed assistant general manager of the British South Africa Co. in Northern Rhodesia. He will take up his appointment at Lusaka early in 1957 in succession to Mr. H. St. L. Grenfell, who was recently elected a director of the company and a member of its executive committee in London.

Lt.-Col. R. L. Broad has resigned from the board of General Exploration Orange Free State Ltd. Mr. M. E. Rich has been appointed a director of the company. Lt.-Col. Broad has resigned also from the board of Dominion Reefs (Klerksdorp). Mr. Rich and Mr. H. A. Makay, who were alternate directors, have been appointed directors. Mr. Rich has been elected as chairman.

Mr. Ralph D. Parker, of Copper Cliff, Ontario, a vice-president of International Nickel, has been elected a director of the company. He succeeds Mr. James S. Duncan.

Major P. D. M. Sions, Mr. P. Fisher, Mrs. F. M. Sions and Mr. Clifford Beck have been appointed directors of Ankole Tinfields. Mr. F. H. Agar, Mr. F. St. John North and Mr. H. P. T. Lattey have resigned from the board. Major Sions has been elected chairman. Maitland Sions and Co. recently announced that control of Ankole Tinfields had been negotiated on behalf of clients.

Mr. E. H. D. Skinner, C.B.E., who has

been chairman of the Durham Division of the National Coal Board since its formation on January 1, 1950, will vacate this office on February 28.

Mr. John Sands has been appointed a director of Harrisons and Crosfield, Ltd.

Cyanamid Products Ltd. have changed their name to Cynamid of Great Britain Ltd.

Joy-Sullivan Ltd., whose headquarters are at Greenock, Scotland, have moved their London and Export Office to 7 Harley Street, W.1. The telephone number of the new office is Langham 7711. The change has come about because of the continued expansion of the company's activities, especially in the export field.

The autumn meeting of the Institute of Metals will be held in Glasgow from September 17-20, 1957.

The 1957 Factory Equipment Exhibition is being staged at Earls Court from April 29 to May 4 and will occupy 250,000 sq. ft. Its theme is "Greater Efficiency in Industry." The exhibits will include electronic control instruments for a great variety of industrial purposes.

A number of important British exporting industries will be represented at the third full-scale Commonwealth Standards Conference to be held since the war, which will open in New Delhi on January 21. The countries which will be represented are Australia, Canada, India, New Zealand, Pakistan and the U.K. The British delegation will consist of 25 representatives from the major British industries concerned and from the B.S.I.

The following forthcoming meetings have been announced by the Institution of Mining Engineers: The Institution of Mining Engineers 63rd annual general meeting, January 31; Manchester Geological and Mining Society, January 17; the Midland Counties Institution of Engineers, January 16, February 13 and March 6; the Midland Institute of Mining Engineers, February 7 and March 7; the Mining Institute of Scotland, January 16 and February 20; the North of England Institute of Mining and Mechanical Engineers, February 16; The North Staffordshire Institute of Mining Engineers, January 14 and February 11; The South Wales Institute of Engineers, January 10 and February 14.

General meetings of the Institution of Mining and Metallurgy in the Session 1956-57 will be held at the Geological Society of London, Burlington House, Piccadilly, London, W.1, on January 17, February 21, March 21 and April 25. The annual general meeting will take place on May 16.

Negotiations have been completed with the Bank of England for a special allowance of dollars for persons from the U.K. wishing to attend the Sixth Commonwealth Mining and Metallurgical Congress in Canada, September-October, 1957.

A conference on nuclear energy for management has been organised by the O.E.E.C. European Productivity Agency, assisted by the organization's Nuclear Energy Secretariat, to take place in Paris from April 1-6, 1957.

PUBLICATIONS RECEIVED

The latest official publications received at this office include the annual report of the Director of Mines and Government Geologist, South Australia, for 1954, with an appendix presenting the case for a greater steel industry in Australia; Mining Reviews issued by the South Australia Department of Mines for the half years ended December 31, 1953, and June 30, 1954; Records of the Geological Survey of Nigeria, 1954; and the digest of Pneumoconiosis Statistics, 1955, issued by the U.K. Ministry of Fuel and Power.

The diagnosis, prevention and treatment of tropical ulcer are reviewed by the Advisory Committee of the Ross Institute in a pamphlet issued as Bulletin No. 4. Originally issued in September, 1950, this bulletin was re-written in November, 1956.

In 1955 the Southern Rhodesia Geological Survey published its Bulletin No. 42, "The determination of Southern Rhodesian Economic Minerals," by N. E. Barlow. This publication was so well received that the entire impression of 1,500 copies was exhausted within eight months. A new and enlarged edition has now been issued.

Some of the more interesting results of geophysical investigation performed in the Gold Coast during the past few years have been made available as the Gold Coast Geological Survey Bulletin No. 21. Copies are obtainable from the Geological Survey of the Gold Coast, P.O. Box 98, Saltpond, Gold Coast, price 9s.

A geological report has been issued by the Ontario Department of Mines on Lount Township, in the district of Parry Sound, where a number of iron showings were prospected and developed at the turn of the century. An aeromagnetic survey of the area was conducted by the Department of Mines in March, 1953. The report may be obtained free of charge from Departmental headquarters at Queen's Park, Ontario.

We welcome the first issue of *Platinum Metals Review*, an illustrated quarterly published by Johnson, Matthey & Co. Ltd., the sole refiners and distributors of platinum metals from the Rustenburg Platinum Mines in South Africa. Its purpose is to provide engineers, chemists, metallurgists and other users with a source of current information on the properties and industrial applications of platinum and its associated metals. A comprehensive service of abstracts of current literature on the platinum metals and their alloys is also provided. Among the contents of the first number are an article describing operations at Rustenburg Platinum Mines, the world's largest producer of platinum, and a review of the platinum metals in catalysis.

Metals and Minerals

Nickel Will Remain Scarce for Several Years

The U.S. Secretary of Commerce, Mr. S. C. Weeks, has reported to Congress that the current critical shortage of nickel may not be relieved before 1960 or even 1965. He reached this conclusion after making a survey of the nickel supply and distribution situation in accordance with the Defence Production Act approved by Congress last year. Congress became alarmed during the last session at reports that a certain amount of nickel was being diverted from the defence stockpile to industrial uses. Stating that the inadequate supply of nickel for all purposes had undoubtedly retarded industrial expansion in several areas, Mr. Weeks emphasized that fair and equitable distribution of available supplies for non-defence purposes was essential.

The Commerce Department has filed with Congress a report highly critical of the nickel supply distribution. The department considers that Inco has treated its customers in an "eminently fair manner," but condemns the base period method of distribution as unsatisfactory, since it does not allow for changes and shifts in consumption nor for technological changes. Producers and distributors of nickel plating materials are alleged to have followed policies and practices "which have resulted in inequities among groups of customers throughout the plating industry and in preferential treatment for some customers." To correct the situation, suppliers of nickel plating materials have agreed to revise their allocation procedures. A new system will be made public by February 1.

The report also said that the lack of nickel was retarding industrial expansion in new uses of nickel, and that the existence of established and free market prices created problems which helped to prevent equitable distribution of the available supply. These inequities are expected to continue until free markets are again established by an adequate supply.

The General Services Administration is not expected to make much headway in the negotiation of nickel contracts for an expansion programme before completion of a re-valuation of the supply situation brought about by Inco's plans to add 65,000 tons capacity by the development of the Mystery-Moak Lakes project in northern Manitoba. The flow of materials and supplies for this project is now being organized. Pending construction of the Canadian National Railway spur, movement of freight to the plant and mine sites will be made by tractor train throughout the winter, so that construction may be pushed forward vigorously in the spring.

THE PLATINUM MARKETS

The U.S. platinum market started the year without change from the uneasily balanced situation that prevailed throughout most of 1956. Available supplies are apparently adequate for current consumption but do not allow consumers to

build up inventories. Primary sellers still allocate metal to established users with an officially published price of \$103/105 per oz. for offerings. Outside dealers offer limited amounts at the same rate or less. The futures market, after a brief spurt, settled back again to tradeless sessions. In London little fresh has emerged in the platinum market. In the absence of trading the free market price is tending to drift lower. The U.S.S.R. is reported not to be offering competitively at the moment.

QUICKSILVER FIRMER

The recent harder tone in the U.K. quicksilver market has persisted. Supplies on the spot are reported to be by no means plentiful. It is understood that not much metal will be arriving in the U.K. in the near future because of good sales in the international market by both Italy and Spain, especially on Far-Eastern account, which are believed to have been transacted on the basis of \$236 per flask f.o.b. It is said that Japan and India are buying metal for use in caustic soda plants. Demand in the U.K. has also picked up.

BELGIAN GERMANIUM CHEAPER

The prices of imported Belgian zone-refined germanium have been reduced. Quotations for 50 ohm./cm. material and 30 ohm./cm. material are now 3s. 5½d. to 3s. 7½d. and 3s. 1d. to 3s. 2½d. respectively per gram delivered. There has been no alteration in the price of imported or domestically produced germanium dioxide.

FIRM MARKET FOR SILVER

Since the start of the year the open market price of silver in New York has remained unchanged at 91.37 c. an ounce. Export demand has dominated the market, more than 1,000,000 oz. being sold for foreign shipment during the first four trading days of 1957. On January 8 export demand accounted for more than 500,000 oz., while local sales and out-of-town transactions declined to 115,000 oz. and 25,000 oz. respectively from 250,000 oz. and 70,000 oz. on the previous day. There was an increased demand for silver in London and shortage of supplies caused prices to advance. At the time of going to press quotations are 80s. ½d. for spot and 80s. ¾d. for forward silver.

NEW OUTLETS FOR ALUMINIUM

In line with the views expressed by other leading aluminium producers, Mr. D. A. Rhodes, vice-president and general

manager of Kaiser Aluminium, believes that prospective 1957 supplies of the metal should "encourage new users with new product developments requiring large tonnages". He anticipates "important break-throughs" in commercial uses of the metal that have been under development for several years. As examples he cited motor car wheel, brake and engine parts and also food containers.

Another pointer towards future outlets is afforded by the installation of a major aluminium, gas-carrying line which was recently completed by Alcan. Eight inches in diameter and 20,000 ft. long, it ranks as the largest and longest unprotected aluminium gas transmission line now in service. It was installed by Lavaca Pipe Line Co. as part of the gas transportation system servicing Alcoa's Point Comfort operations. Alcoa is counting on the high corrosion-resistance of aluminium pipe to ensure efficient low-cost service. Having regard to the vast distances over which oil and natural gas are now being piped, the many large pipelines under construction or contemplated, and the advantages of the light metal, especially in difficult terrain, a growing demand for aluminium piping seems assured.

Alcan has announced an increase in the production capacity of its plants in British Columbia and Quebec, which is to be raised from 650,000 to 762,000 tons. The greater part of this increase will be achieved by expansion at Kitimat.

It is reported from New York that the State Power Authority has voted approval of a proposed contract allotting 200,000 kW. of Seaway power to Reynolds Metals. The cost to the company will be about \$11,000,000 annually. The approval of Governor Averell Harriman is still necessary to make the contract official. The power is required in connection with a proposed project for the construction of a new primary aluminium reduction plant of 100,000 tons capacity at an estimated cost of \$85,000,000-\$90,000,000.

LARGE ASBESTOS FIND

Extensive diamond drilling by Advocate Mines last year on its concession in Newfoundland blocked out a major asbestos deposit, which is considered to be ideal for cheap open-pit mining. The company's president, Mr. M. J. Boylen, states that so far 13,500,000 tons of ore have been established. The grade is estimated to average over \$8.50 per ton, which compares with an average grade of \$5.74 mined by asbestos producers in Canada. On completion of test work now in progress by the Canadian Johns-Manville Co., it will be possible to design a proposed 5,000 ton mill. Surveys have been completed for harnessing a power site in the Burlington Peninsula where a potential 14,000 h.p. is available.

COPPER • TIN • LEAD • ZINC

OUTLOOK FOR COPPER GOOD

The copper market has passed through the Christmas interruption but has not yet regained any momentum. The producers are maintaining their price of 36 c. with the custom smelters offering at 35 c. and some dealers pricing metal a further cent cheaper; copper for export being priced at about 34½ c. per lb. Over the Christmas period the Japanese buying that had provided the only feature in the closing weeks of 1956 virtually dried up, but there is every prospect that it is about to reappear. The buying has, however, been very price conscious and if the Japanese can force an even lower price for export orders, then the plea of the American fabricators that they are being unfairly treated by the producers would be reinforced. Indeed, the main drag on the American price level is the cautious Japanese buying which the American custom smelters are extremely anxious to accommodate, and it is almost certainly a more powerful downward drag than any exercised by the London Metal Exchange at the present time.

In the United States demand continues to be unexciting and fabricators are buying extremely cautiously. They have been encouraged by Bache and Co., which in its recent occasional letter has recommended to copper consumers the New Year resolution that they should only buy copper at the lowest available price. They urge the domestic consumers to discard the belief that if they suck with the big producers, they will be assured of copper supplies through thick and thin, and the letter reminds fabricators that the producers could not find all the copper that was needed at the 46 c. level, and that they had to go into the free market and pay up to 55 c. for their very urgent requirements.

In the circumstances the report of the American Commerce Department that prospects for the American fabricating industry in the first quarter of 1957 were "good" if not quite up to the business done in the first quarter of 1956, is a timely reminder that in spite of all the wailing of the copper producers, economic activity in the U.S. is still at a high level.

Mr. Roy Glover, chairman of Anaconda, stated on a visit to Chile that his company would increase the production of copper in the U.S. by 44 per cent between 1956 and 1961. He added that there were unlimited reserves of low-grade ores in the United States and elsewhere. "With prices to justify recovery of this reserve, there would not be only adequate but abundant supplies of copper available for all possible users for many years to come."

Copper production in Chile for 1956 has now been put at 443,166 metric tons against 390,942 in 1955. This figure represents the output of the American-owned mines and with the total from the smaller mines added, it is being hoped that Chile will be able to produce in excess of 500,000 tonnes in 1957.

The Colonial Secretary and the Governor of Northern Rhodesia have

had talks with Union officials on industrial unrest on the Copperbelt. The Governor has ended the state of emergency which arose from the African strikes and which has lasted about three months.

TEXAS SMELTER SOLD

The Texas smelter has been finally sold to the Wah Chang Corporation at a price of \$1,350,000 with a promise to pay \$2,000,000 more if smelter operations can be made successful. The Federal Facilities Corporation, which sold the smelter, describes it as a scheme for giving the government a share in the profits, but as the facility has been currently valued at around \$5,000,000, the price does not appear to be excessive. Wah Chang is to use the smelter for the production of tungsten from tin alloy and possibly tin smelting but, until the plant has been studied more fully, a firm decision cannot be expected. Spokesmen for the company have, however, said that the plant was "an economic failure as a tin smelter exclusively and probably would be again".

The American Can Company has claimed that it can convert up to 70 per cent of its normal output to tinless cans in 1957 if imports of the metal should be cut off by the Suez crisis.

Total exports of tin metal from Malaya and Singapore in 1956 were 73,256 tons against 71,161 tons in 1955. The 1956 level is the highest since 1950.

ZINC AND LEAD BOTH STEADY

Interest on the part of consumers in the zinc market in the United States has been featureless and the price continues unchanged at 13 c. per lb. East St. Louis for prime western grade. In spite of the lack of excitement, the metal is continuing to move off into consumption at a steady pace, and this is particularly true of zinc for galvanizing.

On the supply side, some interest is provided by the strike at the zinc plant at Corpus Christi of the American Smelting and Refining Company. The labour contract expired at the end of the year and no agreement has yet been reached on a new one. A continuing stoppage from this plant would not for some time cause a squeeze though it would usefully hasten the process of lowering the level of smelter stocks. Since these stocks rose rapidly at the time of the mid-summer steel strike, there have been some considerable reductions but they are not yet at a level the producers would like to see. Another source of disruption to the buyers, though again by no means a critical one, lies in the railway strike in Canada.

An encouraging forecast has been made by Mr. John Kimberley, executive vice-president of the American Zinc Institute. He says that the industry is "looking forward to an exceptionally good consuming year in 1957". He thinks that slab zinc consumption may

well exceed the record of 1,078,968 tons set in 1955. He thought that slab zinc consumption for 1956 would prove to have been about 933,000 tons, which would be the second best year the industry has known.

Last year American zinc production reached 1,062,954 tons and 1,031,018 in 1955; but deliveries were down to 1,035,301 tons against 1,114,316 in 1955, although government purchase in 1956 at 157,014 tons were almost double the 87,200 tons of 1955.

There is nothing to report on the American lead market, where the price is unchanged at 16 c. per lb. in New York. Demand continues at the same rate as for some months past, and the only possibility to interruption of supplies comes from the railway strike. At this stage interference from this strike is not considered serious.

The London Metal Market

(From Our L.M.E. Correspondent)

There have been no developments of particular note during the past week, and the quiet conditions with which the New Year opened on the Exchange have continued. Copper prices staged a mild rally earlier in the week, which, with consumer demand on the quiet side, might be attributed partly to the serious strike on the Canadian Pacific Railway and partly to the effects which any labour unrest in Chile might have on maintaining the 1956 level of production. On the other hand, however, there is at present something approaching 7,000 tons per month of metal from Government sources coming onto a market already aware of the effects a continuation of the serious fuel situation would have on industry. In addition it might be recalled that tenders are due to the Board of Trade in the middle of this month for about 4,800 tons of copper mainly in the form of cathodes.

The strike which has been hanging over the Penang tin smelter of the Straits Trading Co. following a breakdown in wage negotiations commenced on Thursday, but at this early stage it is difficult to assess the effect this will have on market prices. The sale of the U.S. government-owned smelter at Texas has been announced, and the Bolivian concentrates which would be shipped there for treatment will in future be sent to the U.K. On Thursday morning the Eastern price was equivalent to £78½ per ton c.i.f. Europe.

Lead prices have been well maintained, mainly due to the possibility that imports of Canadian metal will be delayed as a result of the C.P.R. strike, and at the same time it is understood that operations at the Trail smelter of the Consolidated Mining and Smelting Co. might be held up on account of the difficulties of moving the concentrates from the mine. Although the U.K. consumer demand is on the quiet side, any surplus metal in Europe has undoubtedly found its way in recent months to the U.S. stockpile.

The above remarks also apply in the case of Canadian zinc shipments to this country where in spite of the reduced consumer demand the present stringency of supplies of nearby metal continues to be evidenced by the maintenance of the backwardation at about £5 per ton.

Closing prices and turnovers are given in the table overleaf.

Mining Finance

Bright Promise for Platinums

Most people to-day subscribe to the belief that the world will continue its expanding trend of industrial activity in the foreseeable future. Fundamentally, this outlook is based upon the prospect of increasing living standards in industrialized areas, together with the fast growing emancipation of those which still remain in an under-developed state. No great stretch of the imagination is required to appreciate the enormous potential markets for consumer goods that could exist if the pattern of world development continues to follow an upward course. If the industrial countries are to be called upon to meet this vast latent demand, a continuous supply of basic commodities will naturally be essential. Amongst these, the metals will undoubtedly rank in the forefront.

When speaking of metals those of the "base" category immediately come to mind, and one is apt to forget the importance of others which are playing a no less important part in the new industrial revolution. Platinum, traditionally associated with the jewellers' trade, is a good example of how a valuable metal—its price is well over two and a half times that of gold—has become a commodity of which 90 per cent of world production is now absorbed by industry. Platinum is the principal member of a group of metals which includes, palladium, iridium, osmium, rhodium and ruthenium. Palladium and rhodium are of growing importance as their uses are becoming more extensive. There is also an increasing demand for the other members of the group.

As with so many of the metals, business conditions in the United States of America are all important in relation to the future course of demand. It is, therefore, well to remember that the U.S. takes about 50 per cent of the world's total production of platinum which in 1955 amounted to about 950,000 troy. oz. Of this total, 76 per cent was used in the chemical industry, 11 per cent in the electrical industry, 10 per cent for jewellery and decorative purposes and 3 per cent for dental and miscellaneous applications. These percentages might be taken as indicative of proportionate usage elsewhere in the world.

A large proportion of platinum metals used in the chemical industry are employed for catalytic purposes. Particularly spectacular has been the increasing demand for platinum as a catalyst for use in the reforming process by which low-grade petroleum is converted into high-grade spirit. Owing to the considerable demand for more and more high-octane petrol, this process has shown an impressive expansion in recent years. And although it must be anticipated that demand for this purpose will slacken to some extent as more and more refineries become fully equipped for the new process, the expansion in oil demand which expected to take place over the coming 20 years should more than offset any fall in offtake as the present market becomes satiated. The use of platinum in the oil industry is a good example of how the

future of this metal is tied to increasing world industrial expansion and the higher living standards which it should bring.

Another industry which is closely bound up with improving living standards is the electrical industry. One only has to remember the enormous potential demand which exists for household consumer articles to appreciate the part that platinum will play in this sphere. In a wider context there is hardly a field of industry or defence from atomics to guided missiles in which platinum is not of critical importance. Amongst its usages are contacts for voltage regulators, thermostats and relays and contacts in high-tension magnetos. Sparking plugs use platinum alloys, while the metal is also in demand for electrical contacts in magnetos and for the accurate measurement of temperature.

Against this background the long-term investment growth attractions for platinum can scarcely be ignored. And as the largest producer of metal in the world Rustenburg Platinum Mines provides a good way of participating in the prosperity enjoyed by companies exploiting this metal. Although Rustenburg is not quoted on any stock exchange, and it is therefore impossible to take a direct investment interest in this company, its shares are rendered marketable by virtue of being held as to 100 per cent by three companies all of which are quoted. Potgietersrust Platinum Mines, with a 44 per cent holding in Rustenburg is the largest participant, with Watervaal (Rustenburg) Platinum Mines owning about 39 per cent, and Union Platinum Mines about 17 per cent, making up the trio. But the picture is not quite as simple as this, for although Potgietersrust's sole investment lies in Rustenburg, Watervaal has shares in both Union and Potgietersrust, while Union also has a stake in Potgietersrust.

| Company | Low 1956 | | Price Now | | Yield % |
|----------------|----------|----|-----------|----|---------|
| | s. | d. | s. | d. | |
| P. Plats | 11 | 0 | 16 | 3 | 7.2 |
| Union | 16 | 4½ | 24 | 9 | 7.5 |
| Watervaal ... | 18 | 1½ | 26 | 6 | 7.5 |

Investment-wise there seems little to choose between these three companies except as regards the question of marketability. In this respect Potgietersrust, with 12,952,500 shares of 9d. each and Watervaal with 7,425,000 shares of 2s. 6d. in issue, definitely have advantages over Union whose issued capital amounts only to 3,300,000 in 5s. shares.

Owing to substantial expansion programmes at Rustenburg over recent years which have, to a great extent, been financed from the company's own resources, dividends have not increased as rapidly as many investors might have anticipated four years ago. Yet with the completion of the latest capital plans—known as the "1956-57 scheme"—the full programme under which annual production of platinum metals will reach about 500,000 oz. yearly by the end of 1957, a more liberal distribution should not be too far in the future. Capital expenditure will, however, remain at a

high level during 1957 and 1958 but will lessen considerably in 1959.

During the year ended August 31, 1956, realization of metals by Rustenburg brought in £3,219,167 from an output which could have been approximately 400,000 oz. For some time a policy of price stabilization has been pursued in the U.K., and the official price for the metal averaged at something over £33 an oz. during 1956. This does not mean to say that Rustenburg will have received this figure for its total production, as although some 65 per cent of its output is in the form of platinum, the remaining 35 per cent is distributed amongst the other platinum group metals all of which fetch sharply varying prices. It could, perhaps, be assumed that the average realization price per oz. might have been nearer £28 an oz. At this point, in the absence of production statistics from the company, a measure of guesswork is necessary in order to estimate profit margins. And if costs are taken conservatively at some £20 an oz., the company could have made a net profit before tax of £10 an oz. of platinum metals produced. Assuming this basis could still be taken by the end of the current year a production rate of 500,000 oz. a year could bring in £5,000,000 annually, or 50 per cent more than in 1956.

While it would obviously be unwise to place too much importance on this sort of estimate, it seems certain that dividends have the chance of rising after 1957. If this view is accepted, the shares of the companies listed above appear to have considerable attractions.

RECORD DIAMOND SALES: PRICE RISES

A sharp advance in sales of gem diamonds during the final three months of 1956, together with a maintenance of industrials at their previous quarter's high level, was responsible for another record year for diamond sales effected by the Central Selling Organization which handles some 95 per cent of total world output. The year's trading was characterized by the demand for stones being limited only by supplies available.

| Quarter 1956 | Gems | | Industrial |
|------------------|------------|--|------------|
| | £ | | £ |
| December | 13,742,129 | | 5,944,289 |
| September | 12,720,017 | | 6,076,701 |
| June | 12,390,315 | | 6,855,391 |
| March | 11,689,779 | | 5,127,389 |
| 1956 total | 50,542,240 | | 24,003,770 |
| 1955 | | | |
| December | 11,675,034 | | 6,512,102 |
| September | 11,138,534 | | 5,581,583 |
| June | 12,209,324 | | 5,004,301 |
| March | 15,231,054 | | 6,936,763 |
| 1955 total | 50,253,946 | | 24,034,749 |

The United States being by far the largest consumer of diamonds in the world, economic conditions in that

country have a dominating effect upon prospects for both gem and industrial stones. It is thus encouraging that current American financial opinion expects the year 1957 to be a record one for business. Indeed, if the expected increase in capital goods and personal spending eventuates, there is no reason to suppose that both gem and industrial diamonds will not follow this trend.

Certain advances in the prices of rough gem diamonds have been announced by The Diamond Trading Company which constitute an average increase of 5.7 per cent. Besides this, Industrial Distributors (Sales) are to increase by approximately 8½ per cent the price of two grades of industrial stones. These are "dresser" qualities used for grinding, and "tool" stones used in making cutting tools.

Since the war diamond price increases have in no way equalled those of other commodities, and the latest rises were only to be expected under present conditions. The last increase in the price of rough gems was in January, 1956, which amounted to approximately 1½ per cent. In 1955 prices were moved up by about 2½ per cent, and in 1954 an increase of 2 per cent was made.

In the case of industrials, stockpiling, possibly on both private and official account, during the latter part of 1956, together with fears engendered by the Suez Canal seizure, forced the price for crushing board quoted by Belgian diamond producers and Industrial Distributors (Sales) up to 18s. 3d. a ct. from 16s. 9d. It was, therefore, only to be expected that this increase would at length be confirmed.

Both De Beers and Anglo American Investment Trust shares have reflected market satisfaction with the latest price increases. In the case of Anglo American Investment Trust the £1 shares put on 10s. to 192s. 6d., while De Beers' 5s. preferred shares rose from 97s. to 105s. During 1955 both these issues suffered considerable fluctuations, the former from a high point of 200s. to a low point of 162s. 6d., and the latter from 132s. 6d. to 91s. 3d.

KAFFIRS REMAIN FIRM

Although favourable business news continues to come forward in the U.S. the customary year-end rally on Wall Street has failed to develop. Starting on January 3 at 499.20 the *Dow Jones Industrial Index* had declined by January 9 to 493.21. Markets in London were steady, a particular feature being the fall in the Treasury bill rate which raised hopes of cheaper money. The news of Mr. Eden's resignation had little immediate effect on prices although Middle East oils went better on hopes of a more speedy settlement of Middle East problems.

The behaviour of Kaffirs was encouraging and the *Financial Times Gold Share Index* improved to 77.1 from 76.7. Diamonds reflected the record sales figures for 1956 and the price rises for both gem and industrials which have been made. Starting the week at about 182s. 6d. Amits gained 10s. to 192s. 6d. Similarly De Beers improved from about 97s. to 105s. Tins were exceptionally

firm with British Tin reflecting the increased final dividend. Coppers showed small gains.

POWER FOR COPPERBELT

Sir Ronald L. Prain, presiding at an informal meeting of shareholders of the R.S.T. group in London yesterday, made the important point that by the end of March next all the Copperbelt's requirements could be met through the use of Wankie coal and by the importation of power from the Belgian Congo.

This situation, Sir Ronald stated, should continue until 1960 at which time hydro-electric power ought to be available from Kariba. There may, however, be a tricky period immediately prior to Kariba coming in as the existing thermal capacity and the Congo power would be stretched to its uttermost to provide in full the constantly increasing needs of the Copperbelt.

REQUIRED BY Burmese Company for Lower Burma—Qualified Assistant Mining Engineer with Alluvial hydraulic experience. Single man preferred. Salary, Kyats 22,000 (£1,650) to Kyats 30,000 (£2,250), dependent upon experience. Free housing and passage. Leave with full pay. Applications, stating age and experience, with references and copies of testimonials to Box No. JA/64, C/o 95, Bishopsgate, London, E.C.2.

THE CENTRAL MINING—RAND MINES GROUP

DIVIDENDS—DECEMBER, 1956

The following dividends payable to shareholders registered in the books of the Companies at the close of business on 31st December, 1956, except where shown, will be paid on or after 8th February, 1957. The dividends on shares to bearer will be paid after surrender of the appropriate coupons at the Office of the London Secretaries of the Companies, 4, London Wall Buildings, E.C.2, or, with the exception of the Company marked with an asterisk, at the Crédit Lyonnais, 19, Boulevard des Italiens, Paris.

The dividends will be payable in British currency, at par, at the rates declared in South African currency (Column No. 4) less South African non-resident shareholders' tax (Column No. 5).

| NAME OF COMPANY (Each incorporated in the Union of South Africa) | Dividend No. | Coupon No. | Amount of dividend declared per share (4) | Deduction in respect of South African non-resident shareholders' tax, per share (5) | Amount of dividend after such deduction, per share (6) | Provisional allowance of credit authorized in the £ (7) | Gross amount of dividend, per share (8) | Rate of South African taxation applicable in the £ (9) | Rate of deduction of United Kingdom income tax in the £ (10) | Amount of United Kingdom income tax deducted, per share (11) | Net amount of dividend per share (12) |
|--|-----------------|---------------|---|---|---|--|---|--|--|--|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Blyvooruitzicht G.M. Co., Ltd. | 22 | — | s. d. | d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| City Deep, Limited | 71 | 71 | 1 0 | 0.90 | 11.10 | 4 3 | 1 2.10 | 10 7½ | 4 3 | 3.00 | 8.10 |
| Consolidated M. Reef M. & E., Ltd. | 94 | 91 | 1 6 | 0.45 | 5.55 | 1 6 | 0 6.00 | 1 6 | 7 0 | 2.10 | 3.45 |
| Crown Mines, Limited | 111 | 111 | 2 0 | 1.35 | 1 4.65 | 4 3 | 1 9.14 | 5 4½ | 4 3 | 4.49 | 1 0.16 |
| Durban Roodepoort Deep, Limited | 72 | 72 | 1 6 | 1.80 | 11.20 | 4 1 | 2 3.90 | 4 1½ | 4 5 | 6.16 | 1 4.04 |
| East Rand Prop. Mines, Limited | 74 | 75 | 2 6 | 1.35 | 1 4.65 | 4 3 | 1 9.14 | 5 0½ | 4 3 | 4.49 | 1 0.16 |
| Modderfontein East, Ltd. | 59 | 40 | 2 6 | 2.25 | 2 3.75 | 4 3 | 2 11.24 | 9 5½ | 4 3 | 7.49 | 1 8.26 |
| †Pretoria Portland Cement Co. Ltd. | 98 | — | 1 0 | 0.90 | 11.10 | 4 3 | 2 2.095 | 4 10½ | 4 3 | 2.995 | 8.105 |
| Rand Mines, Limited | 107 | 107 | 2 3 | 1.843 | 2 1.157 | 4 3 | 2 7.946 | 7 1½ | 4 3 | 6.788 | 1 6.369 |
| Transvaal Consolidated Land and Exploration Co., Ltd. | 34 | 34 | 3 0 | 2.70 | 2 9.30 | 4 3 | 3 6.29 | 6 5 | 4 3 | 8.99 | 2 0.31 |
| *Transvaal Gold M. Ests., Ltd. | 92 | 92 | 10 | 0.75 | 9.25 | 1 6 | 0 10.00 | — | 7 | 3.50 | 5.75 |

† This dividend is payable to shareholders registered in the books of the Company on 30th November, 1956.

Where no figures are shown in Column No. 9, the rates of South African taxation applicable in the £ cannot yet be ascertained, as they are dependent on the final particulars of the South African taxation of the companies concerned which are not yet available.

PAYMENT OF COUPONS

COUPONS presented for payment at the Office of the London Secretaries will, unless accompanied by Inland Revenue declarations, be paid at the rates shown in Column No. 12, which are arrived at after deduction of United Kingdom income tax (Column No. 11), at rates reduced to allow of relief in respect of Dominion taxes (Column No. 10). If accompanied by Inland Revenue declarations, they will be paid at the rates shown in Column No. 6. They must be left at least four clear days for examination and may be presented any day (Saturdays excepted) between the hours of 11 and 2. Depositors will be notified at the time of deposit when the cheques will be ready. LISTING FORMS may be had on application.

COUPONS presented at the Crédit Lyonnais, Paris, will be subject to the deduction by them of French income tax from the amounts of the dividends shown in Column No. 6.

Note: The Companies have been asked by the Commissioners of Inland Revenue to state:—

Under the provisions of Section 348 and the 17th Schedule of the Income Tax Act, 1952, as amended by Section 26 of the Finance Act, 1953, relating to "unilateral relief" from double taxation, South African tax applicable to the dividends is allowable as a credit against the United Kingdom tax payable in respect of the dividends. The deduction of tax at the reduced rates in the £ (Column No. 10) instead of at the standard rate of 8s. 6d. in the £ represents a *provisional* allowance of credit at the rates shown in Column No. 7. The final rate of credit allowable to a particular shareholder depends on his personal rate of tax and may be more or less than the rates shown in Column No. 7. Revision of the credit involves corresponding adjustments of the gross amounts of the dividends for United Kingdom tax purposes (Column No. 8).

In the case of Transvaal Gold Mining Estates, Ltd., the provisional allowance of credit at the rate of 1s. 6d. in the £ is in respect of the South African non-resident shareholders' tax. It is not yet possible to say what further credit (if any) will be due on this dividend in respect of Dominion Income Tax paid on the Company's profits. Shareholders will be notified in due course of the rates of any such further credit and of the manner in which the credit may be obtained.

THE GROSS AMOUNT OF THE DIVIDEND, PER SHARE, TO BE INCLUDED IN ANY STATEMENT OF TOTAL INCOME FOR UNITED KINGDOM INCOME TAX AND SURTAX PURPOSES IS SHOWN IN COLUMN NO. 8.

4, London Wall Buildings, London, E.C.2.
January 8, 1957.

A. MOIR & CO.,
London Secretaries of the above-named Companies.

These Batteries like hard work—Locos demand it!

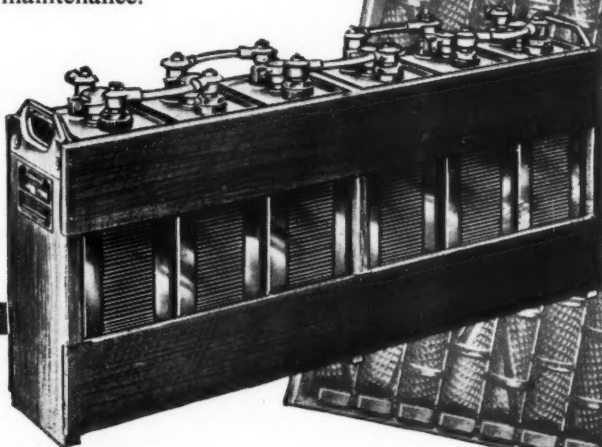
Britannia Nickel Iron Alkaline batteries give long and trouble-free service. The secret of their success is in the soundness and simplicity of their design: the active material being contained within *tubular steel plates*.

LESS WEIGHT, MORE POWER!

Britannia batteries give the heaviest discharges without damage. Their steel construction renders them immune from the effects of vibration; and though light in weight, they have great mechanical strength.

The Britannia Tubular Battery is recognised as the most durable and dependable battery for severe conditions involving high temperature or unskilled maintenance.

**Write for Publication
No. 101**—an attractively
illustrated, 16-page book-
let, giving specifications
and full details.



Britannia

STEEL ALKALINE BATTERIES

BRITANNIA BATTERIES LIMITED • 53 VICTORIA STREET • LONDON SW1 • TELEPHONE: ABBEY 6168-9

A.111B

FINANCIAL NEWS AND RESULTS IN BRIEF

Messina's New Acquisition.—The Messina (Transvaal) Development Company has bought the Copper Queen Mine at Umvumas from Messrs. Tilbury Bros. It is stated that the area purchased lies south-west of Sinoia.

Production Starts at Algom.—Two properties belonging to Algom Uranium Mines—Quirke and Nordic Uranium Mines—situated in the Blind River district of Ontario have either reached, or are on the point of reaching, the stage of mill production.

Rhodesia Rlys. Trust Pays More.—Rhodesia Railways Trust (which is controlled by the British South Africa Co.) is paying 14 per cent for the year ended December 31, 1956, compared with 12½

per cent previously. Net profits after tax increased to £202,441 from £180,718.

Winkelhaak Obtains 356 In.-Dwt.—In a quarterly report covering the period ended December 31, 1956, Winkelhaak Mines has disclosed that 690 ft. developed from No. 3 A ventilation winze averaged 7.1 dwt. of gold per ton over 50 in., or 356 in.-dwt. In the previous quarter values were much higher at 681 in.-dwt.

Jantar and Columbite.—In his statement to shareholders of The Jantar Nigeria Co., Mr. C. A. P. Tarbutt, the chairman, stated that markets for columbite had been difficult throughout the year ended September 30, 1956. The price had decreased from 250s. per unit to 195s. per unit. This was equivalent to £721 per ton at an assay of 74 per

cent combined contained pentoxides. Mr. Tarbutt revealed that to date 137 tons of the current financial year's output had been disposed of. But present indications showed that it would be even more difficult to sell columbite during the coming year. There was little indication of improvement in the near future.

Frontino Offer.—Shareholders of Frontino Gold Mines are reminded that the recent offer from South American Gold has been extended and is now not due to close before January 31. It was recently announced that the offer had been accepted by more than 90 per cent in value of both preference and ordinary holders and thus became unconditional on December 7.

Anaconda's New Issue.—The Anaconda Copper Company has tentatively approved a proposal to raise additional capital by means of a rights issue, the terms of which will be decided later. The company expects to spend some \$100,000,000 on expansion during 1957.

METALLURGISTS or METALLURGICAL CHEMISTS B.Sc., or equivalent, required for Tin Smelting Works in Singapore and Malaya. Age 22/30. Single. First-class passage, and free furnished quarters provided. Provident Fund. Salary according to qualifications and experience, but not less than £1,200 p.a. Apply giving full details of age, qualifications and experience to Box 591, The Mining Journal Ltd., 15 Wilson Street, Moorgate, London, E.C.2.

AGENCE MINIERE ET MARITIME S A

2, RUE VAN BREE - ANTWERP - BELGIUM

Sworn weighers, samplers of ores, metals and residues.

Agents for shippers at European ports and plants.

Telegrams: Rentiers-Antwerp Telex 1693

THE WORLD'S GREATEST BOOKSHOP

FOYLES
FOR BOOKS

FOR ALL YOUR

Technical Books

STOCK OF OVER THREE MILLION VOLUMES

Foyles have depts. for Gramophone Records, Stationery, Handicraft Tools and Materials, Music, Magazine Subscriptions.

119-125 CHARING CROSS ROAD LONDON, WC2

Gerrard 5660 (20 lines) ★ Open 9-6 (incl. Sats.)

Two mins. from Tottenham Court Rd. Sta.

RAND & O.F.S. RETURNS FOR DECEMBER

| Company | December, 1956 | | | Year ends | Current Financial Year Total to date | | | Last Financial Year Total to date | | |
|--------------------------|----------------|-------------|----------------|-----------|--------------------------------------|-------------|----------------|-----------------------------------|-------------|----------------|
| | Tons (000) | Yield (oz.) | Profit† (£000) | | Tons (000) | Yield (oz.) | Profit† (£000) | Tons (000) | Yield (oz.) | Profit† (£000) |
| Goldfields | | | | | | | | | | |
| Doornfontein a..... | 80 | 32,008 | 160 | J | 448 | 177,526 | 816 | 306 | 123,089 | 498 |
| Libanon..... | 98 | 22,057 | 55 | J | 580 | 129,810 | 328 | 583 | 127,093 | 352 |
| Luipaards Vlei b..... | 76 | 13,909 | 8 | J | 499 | 89,611 | 61 | 500 | 104,184 | 137 |
| Rietfontein..... | 26 | 5,776 | 16 | D | 368 | 70,043 | 221 | 314 | 71,672 | 236 |
| Robinson..... | 70 | 14,633 | 5 | D | 917 | 185,524 | 55 | 983 | 210,879 | 214 |
| Simmer & Jack c..... | 90 | 16,037 | L17 | D | 1,208 | 213,003 | 178 | 1,422 | 238,842 | 203 |
| Sub Nigel..... | 66 | 18,454 | 43 | J | 398 | 114,636 | 323 | 399 | 126,049 | 476 |
| Venterspost..... | 121 | 29,101 | 64 | J | 743 | 166,636 | 405 | 731 | 172,099 | 455 |
| Vlakfontein..... | 49 | 17,531 | 86 | D | 545 | 195,061 | 964 | 465 | 170,654 | 869 |
| Vogels a..... | 100 | 23,800 | 65 | D | 1,203 | 296,014 | 915 | 1,235 | 318,301 | 1,304 |
| West Drie a..... | 75 | 71,216 | 581 | J | 450 | 419,817 | 3461 | 426 | 329,869 | 2,605 |
| Anglo American | | | | | | | | | | |
| Brakpan..... | 109 | 18,480 | 15 | D | 1,284 | 225,797 | 155 | 1,283 | 219,170 | 182 |
| Daggas a..... | 212 | 47,311 | 258 | D | 2,637 | 595,135 | 3350 | 2,658 | 607,434 | 3703 |
| East Daggas..... | 94 | 15,421 | 30 | D | 1,140 | 187,279 | 399 | 1,146 | 190,933 | 533 |
| F. S. Geduld d..... | 46 | 22,653 | 100 | S | 139 | 64,841 | 286 | — | — | — |
| Lorraine a..... | 61 | 11,708 | L7 | S | 180 | 34,298 | L24 | 125 | 20,597 | L85 |
| President Brand a..... | 60 | 46,341 | 380 | S | 181 | 138,909 | 1145 | 155 | 124,090 | 1028 |
| President Steyn..... | 88 | 34,464 | 201 | S | 263 | 102,294 | 601 | 247 | 88,960 | 490 |
| S. A. Lands..... | 85 | 19,046 | 70 | D | 1,071 | 227,485 | 795 | 1,104 | 211,524 | 650 |
| Springs..... | 125 | 14,619 | 8 | D | 1,513 | 182,036 | 119 | 1,454 | 187,521 | 125 |
| Vaal Reef f..... | 55 | 23,112 | 132 | D | 401 | 151,195 | 756 | — | — | — |
| Welkom a..... | 88 | 21,756 | 51 | S | 255 | 63,068 | 136 | 245 | 50,441 | 50 |
| Western Holdings. a..... | 88 | 39,684 | 255 | S | 221 | 117,765 | 756 | 221 | 83,992 | 499 |
| West Reef Ex a..... | 120 | 25,690 | 59 | D | 1,438 | 394,591 | 608 | 1,411 | 268,388 | 662 |
| Central Mining | | | | | | | | | | |
| Blyvoor a..... | 97 | 55,014 | 394 | J | 632 | 355,334 | 2607 | 628 | 356,032 | 2623 |
| City Deep..... | 156 | 29,919 | 14 | D | 1,851 | 357,427 | 68 | 1,936 | 367,580 | 17 |
| Cons. M.R..... | 157 | 22,259 | 8 | J | 992 | 138,002 | 56 | 1,034 | 146,755 | 117 |
| Crown..... | 267 | 38,608 | L10 | D | 3,295 | 480,424 | 196 | 3,588 | 775,000 | 596 |
| D. Roodepoort..... | 176 | 31,154 | 53 | D | 2,188 | 378,941 | 634 | 2,170 | 367,487 | 604 |
| East Rand Prop..... | 203 | 54,308 | 167 | D | 2,538 | 661,494 | 2135 | 2,540 | 625,440 | 2003 |
| Harmony a..... | 72 | 28,261 | 138 | J | 463 | 181,594 | 976 | 423 | 158,117 | 802 |
| Modder East..... | 134 | 14,165 | 7 | J | 836 | 86,298 | 51 | 771 | 82,262 | 46 |
| Rose Deep..... | 46 | 7,250 | 0.4 | D | 534 | 85,083 | 6 | 668 | 104,872 | 60 |
| J.C.I.* | | | | | | | | | | |
| E. Champ. d'Or a..... | 11 | 302 | L29 | D | 162 | 8,738 | L324 | 237 | 18,037 | L412 |
| Freddies Cons. a..... | 53 | 13,105 | L29 | D | 787 | 151,548 | L412 | 957 | 167,932 | L586 |
| Govt. G.M.A. a..... | 198 | 29,137 | 0.5 | D | 2,765 | 358,280 | 17 | 3,006 | 380,634 | 176 |
| Randfontein a..... | 207 | 17,761 | L365 | D | 2,688 | 264,619 | L3708 | 3,118 | 336,681 | L3672 |
| Union | | | | | | | | | | |
| East Geduld..... | 132 | 41,265 | 297 | D | 1,720 | 531,083 | 3808 | 1,765 | 545,410 | 4096 |
| Geduld Prop..... | 101 | 15,915 | 26 | D | 1,245 | 197,266 | 377 | 1,133 | 198,185 | 538 |
| Grootvlei..... | 190 | 40,850 | 218 | D | 2,344 | 504,902 | 2751 | 2,322 | 503,448 | 2937 |
| Marievale..... | 70 | 18,404 | 84 | D | 855 | 224,518 | 1039 | 857 | 222,185 | 1068 |
| St. Helena..... | 114 | 33,410 | 186 | D | 1,312 | 380,997 | 2084 | 1,238 | 330,837 | 1635 |
| Van Dyk..... | 75 | 12,294 | 2 | D | 953 | 154,602 | 21 | 962 | 157,656 | 26 |
| General Mining | | | | | | | | | | |
| Ellaton a..... | 32 | 6,930 | 17 | D | 385 | 87,429 | 307 | 369 | 103,946 | 474 |
| S. Roodepoort..... | 28 | 6,727 | 24 | J | 174 | 40,572 | 149 | 166 | 37,632 | 134 |
| Stilfontein a..... | 93 | 38,930 | 241 | D | 1,079 | 428,680 | 2545 | 1,009 | 396,454 | 2467 |
| W. Rand Cons. a..... | 144 | 22,191 | L73 | D | 2,509 | 282,370 | L1115 | 2,708 | 318,566 | L50 |
| Anglo-Transvaal | | | | | | | | | | |
| Hartebeestfontein a..... | 75 | 37,500 | 229 | J | 420 | 206,778 | 1240 | 298 | 125,519 | 586 |
| N. Klerksdorp a..... | 11 | 1,227 | L4 | D | 131 | 14,815 | L62 | 133 | 16,478 | L23 |
| Rand Leases..... | 47 | 7,379 | L211 | J | 931 | 143,991 | L188 | 1,076 | 171,669 | 170 |
| Village M.R..... | 36 | 5,724 | 9 | J | 202 | 31,361 | 52 | 206 | 30,350 | 57 |
| Virginia O.F.S. a..... | 95 | 24,225 | 60 | J | 541 | 111,042 | 334 | 416 | 88,528 | 168 |
| Others | | | | | | | | | | |
| N. Kleinfontein..... | 96 | 11,217 | 3 | D | 1,235 | 145,846 | 13 | 1,277 | 151,913 | 61 |
| Wit Nigel..... | 18 | 3,998 | 7 | J | 108 | 23,927 | 49 | 110 | 22,871 | 50 |

Operations at Merriespruit remain suspended. † Working Profit. * Working Profit includes Sundry Revenue. a Excluding revenue from Uranium, Acid and Pyrite. b Main reef only c Production affected by fires. d Production began January 1956. e Production began May 1956.

5
3
0
7
8

1
0

ofit